DAVIS (E.)

LESSONS

IN

BOTANY,

DESIGNED FOR THE USE OF

SCHOOLS AND ACADEMIES.

Westfield, Mass.
PUBLISHED BY J. D. HUNTINGTON.

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PREFACE.

This small Treatise is designed to bring down the principles of Botany to the comprehension of children and youth. Those books that explain botanical terms are so voluminous, and so mixed with other matter, that they are unmeaning to youthful readers; books that describe plants either include all in a very extensive or very limited region, and consequently contain comparatively few known to an individual. The writer has learned by long experience, that youth become discouraged when these books are put into their hands, from the seeming difficulty of the undertaking, and has prepared this book to remove the obstacle. He has given concise descriptions of all the leading botanical terms and arranged them under their appropriate heads. He has annexed descriptions of about 100 plants which may be found in every neighborhood.

After the scholar has become acquainted with the terms as defined in the lessons, let him take a plant, turn to the description of it, which may be found by consulting the index of popular names, and compare the parts carefully with the description.

After having gone through with this book, it is believed the scholar will be able to use advantageously the Manuals of Torrey and Eaton. Or if he choose to stop here, he will know what botany is, and will have learnt that plants are curious specimens of workmanship, exhibiting clear marks of mechanical contrivance, worthy of him who said "let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after his kind."

LESSONS IN BOTANY.

LESSON I.

Botany teaches the distinguishing characters, the names, organization and uses of plants.

The design of this Treatise is to point out the leading characters of plants, and define the terms used in botanical works.

Plants may be divided into two great classes, *phanerogamous* and *cryptogamous*.

Phanerogamous plants are those which have flowers containing visible stamens, and pistils, as the violet and rose.

Cryptogamous are those which have no visible stamens and pistils.

It is manifest that if ten, twenty, or fifty thousand plants were described in a book having their names alphabetically arranged, that it would be an endless task to find the name of any unknown plant. For the sake of convenience, botanists have arranged them in classes which are divided into orders, and again into genera, all of which are distinguished by certain prominent characters taken from what are called the *primary organs*.

There are seven primary organs, Stamen, Pistil, Calyx, Corol, Pericarp, Receptacle and Seed.

A.—*Stamen.* This organ is in the centre of the flower, and consists usually of a small stem supporting a knob, or an oblong. A flower may have from one to fifty stamens; in the rose they are numerous, yellow, and called by children seeds. Lilac

blossoms have only two stamens, the common yellow and the red lilly have six.

The Stamen consists of three parts, *filament*, *anther*, *and pollen.*

The *filament* is a small stem, which supports a knob or oblong called *anther.* In the anther is contained a very minute powder, which is called *pollen.*

B.—*Pistil.* This organ consists of one or more small stems, or filaments standing in the midst of the stamens. It differs from them in length, color, and general appearance; and is divided into three parts, stigma, germ and style.

The *stigma* is the topmost part of the pistil usually globose. The *germ* is the lowest part, and forms, in most plants, the seed vessel, as a bean pod is a germ the extreme point of which is the stigma. The *style* is the filament or tube between the germ and stigma. The pollen which is the rudiment of the future seeds falls upon the stigma, and descends through the tubular filament to the germ. It appears that stamens and pistils are necessary to the production of seed.

Remarks. The anther is a thin membraneous sack containing the pollen; which when sufficiently mature bursts from the membrane and lodges upon the stigma. The pollen is lighter than the atmosphere, when the pistil is longer than the stamens, and heavier, when shorter.

If the anthers be exposed to wet, they will burst before the pollen is mature, and the flower, if solitary, will produce no seed. To avoid such a consequence, the stamens are shielded from the wet. The stigma of the side-saddle flower is a large shield spread over the stamens like an umbrella. The flower-deluce has a kind of roof over each stamen. The laurel has ten small cavities in the flower in which the anthers remain concealed till the pollen is mature. Some flowers close up when it rains, others bend downward to shield the stamens.

The shielding of the stamens from the wet, shows that flowers are the work of a being of infinite wisdom. What a wonderful contrivance is displayed in the formation of the stamens and pistils that they may produce seed and propagate their species!

LESSON II.

C.—*Calyx.* The next essential organ is the Calyx, which is a name given to the leaves on the out side of the flower. They are usually green.

The calyx may be one or many leaved. There are seven different kinds.

1. The calyx is a *perianth* when it touches the colored leaves of the flower, as pink, butter-cup, rose, and violet.

2. It is called *involucre* when it is at a distance below the flower. This calyx is peculiar to plants whose flowers are clustered in the manner of caraway, fennel, dill, parsnip, &c. In some of these, at the foot of the branches bearing the seed, will be found some small leaves which are the involucre.

3. *Ament, or Catkin,* is another kind of calyx found on the willow, alder, birch, oak and chesnut. The flowers on these plants are arranged along a stem, and consist of numerous scales with several stamens, attached to each.

4. The next variety of calyx is a *spathe,* which consists of a single leaf covering a head of flowers. It is found in skunk's cabbage, and is that part of it which first appears in the spring. The thin membrane that envelopes a head of onion flowers previous to flowering is a spathe.

5. The *glume* or *husk* is the next kind of calyx. It belongs to most kinds of grass and grain, and is the chaff of oats.

6. The next kind is the *calyptre*, a calyx peculiar to mosses.

7. The last is the *volva*, a kind of veil that covers a mushroom when it springs from the ground. It often disappears soon, sometimes it falls down, dries and forms a hard ring about the stem.

Remarks.—The perianth is very various. In some plants it consists of numerous scales over laying each other like the shingles on a roof, and is said to be *imbricate*, as in may-weed and daisy. It is sometimes *double* having two sets of calyxes, one immediately below the other, as the holly-hock.—It may be *cylindric* or *toothed* as the garden pink; and *hooked* as in the *burr-dock*. The calyx is *inferior* when it grows below the germ or seed vessel, as red pepper, *superior* when above it, as in the rose, apple and quince. Some plants are destitute of a calyx; and it falls from others, as the blood-root, as soon as it blossoms; it is then *deciduous*.

D.–The *corol* is the fourth primary organ, and consists of the colored leaves of the flower, red or white in the rose, yellow in the butter-cup, blue in the violet generally, and white in the apple and strawberry. One leaf of a flower is called a *petal*. Some flowers as lilacs have but one petal, some have more. Hence corols are said to be one petalled, or many petalled.

There are five kinds of one petalled corols, distinguished by their shape.

1. *Bell-form*, or campanulate in the shape of a bell, as the canterberry bells, bell-flower.

2. *Funnel-form*, having the shape of a funnel, or tunnel, as the morning glory.

3. *Salver-form* having the form of an ancient Salver, consisting of a tube, and a spreading border, as lilac, and lychnedia.

4. *Wheel-form* having a corol spread out, as the high and low laurel.

5. *Labiate* or lipped as sage and most of the mints ; the highest part of the opening called upper lip, the other under lip.

Remarks.—Instead of Salver-form some authors use the word hypocrateriform. Some describe the whortleberry flower, as pitcher-form.

There are also five kinds of many petalled corols.

1. *Cruciform* having four petals as mustard, cabbage, turnip, &c.

2. *Caryophilous* having five petals and each a long claw, as long as the tubular calyx, as pinks.

3. *Rosaceous* having five broad petals, with very short claws as rose, apple, strawberry.

4. *Liliaceous* having six petals, as the yellow and red lillies common in grass land.

5. *Papilionaceous*, as the pea and bean blossom. The corol has four distinct petals, the large one overspreading the whole called the banner, the side petals, wings, and the lower one the keel, which shields the stamens.

Remarks.—No wild flower in North America has more than six petals, if we except the pond lilly and perhaps one or two others. Numerous petals in the rose, poppy &c. are the the effect of cultivation.

LESSON III.

E.—The Pericarp the fifth organ is the seed vessel of which there are seven kinds.

1. *Capsule*, or a seed vessel that is hard, dry and woody when the seed is mature. The capsule opens by *valves*, and the seed is lodged in separate apartments called cells as lilac, poppy, mullein.

2. *Siliqua*, a pod with two valves, as the bean and pea pod.

3. *Legume*, a pod with two valves and a partition through the centre forming two cells, as the pod of cabbage, mustard.

4. *Drupe*, a pulpy substance containing a hard nut as cherry, peach and plumb.

5. *Pomum*, a pulpy substance containing a membranaceous capsule, as apple, quince and pear.

6. *Bacca, or berry*, a pulpy substance having the seed scattered through it without a capsule as currant, grape, strawberry, whortleberry.

7. *Strobile* a stem covered with woody scales, having a seed at the base of each, as pine burrs.

Remarks.—The nuts of the walnut, hazlenut and chesnut are distinct kinds of capsules, and the covering of the nut is a calyx of a peculiar kind.—The same may be said of acorns.

F.—The sixth primary organ is the *seed.* It has four parts.

1. *Parenchyma*, tegument, or covering as the skin of a bean, or pea.

2. *Cotyledons*, or lobes, the substance contained in the parenchyma; in beans, peas, mustard, squash and melon seeds there are two; in rye, wheat, and corn one.

3. The *corcle*, or plumula and radicle, that part of the seed which forms the young plant.

4. *Hilum*, or eye by which it is attached to its pericarp.

Remarks.—Plants are by some writers divided into two classes distinguished by the cotyledons. If the seed have one cotyledon it belongs to the *monocotyledonous* class if two to the *dicotyledonous.*

G.—The *Receptacle* or that part which supports the other six is the seventh essential organ. There are five kinds of receptacles.

1. *Proper receptacle* which supports one single flower, as the stem supporting a peach, a cherry, or rose.

2. *Common*, which supports many flowers, as the broad plate of the sun flower, or the small white head of the dandelion remaining after the seed has blown away.

3. *Rachis*, or the slender stem running through a head of rye or wheat.

4. *Columella*, a central column supporting the seed, as a cob in an ear of corn.

5, *Spadix*, a central column to which the seed is attached, but extending some distance above it, as in the wild turnip.

Remarks.—We have now taken a view of the seven primary organs. By the stamens and pistils plants are divided into classes and again into orders; by the other five organs, orders are subdivided into genera. The genera are furthermore divided into species by characters drawn from other parts of the plant, hereafter to be described.

LESSON IV.

Plants are divided into twenty two classes, which will now be explained.

1st Class includes plants whose flowers have *one* stamen.

2d, Class includes plants whose flowers have *two* stamens, as lilac, sage, penny-royal.

3d, Includes plants whose flowers have *three* stamens as flower-de-luce and most kinds of grass.

4th, Includes plants whose flowers have *four* stamens, as Patridge berry, Teasel, dogwood.

5th, Includes plants whose flowers have *five* stamens, as violet, potatoe, currant.

6th, Includes plants whose flowers have *six* stamens, as Solomon seal, and asparagus.

7th, " " " " *seven* stamens, as Horse-chesnut.

8th, " " " " *eight* stamens, as maple, cranberry.

9th, " " " " *nine* stamens, as sassafras, and fever bush.

10th, " " " " *ten* stamens, as whortle berry, and garden pink.

11th, " " " " from *twelve* to *twenty* stamens *standing on the corol*, as purslane, snake-root, and house-leek.

12th, " " " " *twenty* or more stamens standing on the *calyx*, as thorn-bush, apple, plumb.

13th, " " " " *twenty* or more stamens standing on the *receptacle*, as poppy, peony or pina, cowslip.

14th, " " " " *four* stamens two long and two short, as balm, thyme, horehound.

15th, " " " " *six* stamens, four long and two short, as mustard, cabbage, turnip.

16th, Includes those plants whose stamens are united by their filaments in *one* set, as crane bill, holly-hock, mallows.

17th, Includes plants whose stamens are united by their filaments in *two* sets, as pea, bean.

18th, Includes plants having compound flowers, that is, many flowers in one common calyx, as sunflower, dandelion, daisy.

19th, Includes plants whose stamens stand on the pistil, as orchis and ladies-slipper.

20th, Includes plants whose stamens and pistils are in separate flowers *on the same plant*, as oak, chesnut, birch, walnut.

21st, Includes those plants whose stamens and pistils are in separate flowers, not on the same plant, as willow.

22d, Includes all cryptogamous plants.

Orders—The orders, into which the first thirteen classes are divided, are distinguished by the number of pistils. If the plant have *one* pistil it belongs to the *first* order, *two* to the second, *three* to the third, if more than *seven* to the *thirteenth* order. The lilac has *two* stamens and *one* pistil, and is of the second class first order. The violet has five stamens and one pistil, and is of the 5th class 1st order.—Wood sorrel has ten stamens and five pistils, and is of the 10th class and 5th order.

The 14th class has two orders, *first*, seeds naked, *second*, seeds covered.

The 15th class has two orders, *first* having pod-like capsules, as wide as they are long, *second* pods much longer than they are wide, as cabbage.

The 16th, 17th, 19th, 20th and 21st classes have their orders distinguished by the number of stamens. A plant having *five* stamens with their filaments united in one sett, belongs to the 16th class and 5th order. If there be five stamens standing on the pistil, the plant is of the 19th class, 5th order.

The 18th class is divided into five orders.

1st, has all the flowers perfect.
2d, has the disk flowers perfect, ray pistillate.
3d, - - - - ray neutral.
4th, has the disk staminate, ray pistillate.
5th has the flowers all perfect, and each has a calyx.

The 22d class is divided into 6 orders, or families of plants.

1st, *Filices*, ferns, or brakes.
2d, *Musci*, or mosses.
3d, *Hepaticae*, or liverwort.
4th, *Algae*, or sea weed.

5th *Lichenes* or lichens, growing on earth and wood. 6th, *Fungi*, or mushroom, toad-stool.

LESSON V.

The seven primary organs which have already been described may be called *generic characters*, because by them the genera of plants may be determined. There may be many species of the same genus, as there are many species or kinds of oak and pine trees, of roses, of currants and of violets. The characters, by which *species* are distinguished from each other, may be called *specific characters*.

Specific characters are derived from *five* sources, Leaves, Inflorescence, Stems, Roots, and Appendages.

A.—*Leaves.*—The leaves of plants are deciduous falling off in autumn, or evergreen continuing through the winter, as pine and hemlock.

Leaves may be considered in regard to their *situation, position, insertion, form, surface, margin, and termination.*

1. *Situation.*—Leaves are *radical* that grow out from the root as plantain ; the radical leaves are often totally different from the stem leaves. They are *alternate* when situated on opposite sides, at about equal distances above each other ; *scattered* when irregularly situated ; *opposite* when one is one side of the stem, and the other over against it ;—*whorled* when several leaves come out forming a circle about the stem.

2. *Position.*—Leaves are *erect* when they ascend as grass ; *horizontal* when they make right angles with the stem ; *recurved* when they bend downward ; *two ranked* pointing in two directions ; *decussate* pointing in four ; *unilateral* pointing in one direction.

3. *Insertion.*—Leaves are *petioled*, when supported by a stem; *sessile* when without a petiole; *peltate* when the stem is attached to the centre of the leaf instead of being at one end, as nasturtion;—*clasping* when the leaf is not only sessile, but half surrounds the stem; *perfoliate*, when it wholly surrounds the stem; *sheathing* as in grass and grain; *decurrent* when the edges of the leaves run down the stem, as mullein.

4. *Forms.*—The more common forms of simple leaves are the following; *ovate*, having the shape of an egg, as cherry; *ob-ovate* differs from ovate in having the stem at the small end; *cordate* heart shaped as lilac leaves; *ob-cordate*, differs from cordate in having the stem at the small end, as wood sorrel; *oval* or elliptical, widest in the middle and tapering at each end; *oblong* very long oval, as chesnut; *orbicular* round, as water lilly; *kidney-form* in the shape of a kidney bean; *linear*, long, and all the way nearly of the same width, as grass leaves; *lanceolate*, having the shape of a lance, long, tapering, as peach; *hastate*, in the shape of a spear, as common field sorrel; *arrow form*, having the shape of an arrow; *palmate*, somewhat in the shape of a hand; *pedate*, having the shape of a bird's foot.

Of compound leaves the following forms are more common. *Ternate*, composed of three little leaves, or leafets, as clover; *Biternate*, is when a stem is divided into three branches, and each branch has three leaves; *quinate*, composed of five small leaves, as five-finger; sometimes there are seven or nine, as in elder, sumach, and are said to have three or four pairs with a terminal leaf; *pinnate*, like a goose quill, having the little leaves on each side of the stem entirely distinct from each other, as in some ferns; *capillary*, like asparagus; *pinnatifid* differs from pinnate in this, the little leaves are not whol-

ly separated from each other; *interruptedly pinnate*, like potatoe.

Remarks.—A leaf may have a resemblance to two simple forms, as it may be ovate, but too long in proportion to its width, and then might be called *oblong-ovate*, or the small end may taper out like a lance and then it is *ovate-lanceolate*. The end of a leaf of grass is often lance-form and then it is said to be *linear-lanceolate*. Thus by combining the terms already mentioned, all forms of leaves may be described.

The syllable *sub* is prefixed to botanical terms, when it has only a partial resemblance to its true form, as if a leaf be a little notched on each side of the stem it is said to be *sub-cordate*; sub-ovate means somewhat ovate.

LESSON VI.

[*Leaves continued.*]

5. *Margin.*—Every child probably has observed that the margin, or edges of leaves differ from each other. *Serrate* is when the leaf has a margin like the edge of a saw, the teeth all inclining towards the small end of the leaf, as the leaf of the cherry, elder; *crenate*, a scolloped leaf; *toothed*, teeth erect not inclining towards the small end of the leaf; *lobed* as an oak, or maple leaf; *gashed*, or *cleft* when the leaf is split more or less deep as butter cup; *Spinous* having prickles on the margin, as the leaf of the thistle; *runcinate*, the teeth or divisions inclining towards the petiole; *revolute*, when the margin is rolled out; *involute*, margin rolled in; *ciliate* having a row of fine hairs standing on the margin; *entire*, margin perfectly smooth.

6. *Surface.*—*Pubescent* or downy surface, covered with fine soft hairs; *hairy* or *pilose*, hairs longer and more scattered than when pubescent; *silky* when the hairs are long, thick and pressed to the leaf having the lustre of silk; *woolly* when the hairs are thick and curly, as mullein; *smooth* when free from hair, pubescence; *glaucous*, of a sea green colour; *nerved* when the veins run the whole length of the leaf; *veined* when the veins branch variously from the midrib, as apple tree leaves; *veinless* without veins or nerves, as the floating leaves of water lillies.

7. *Termination.*—*Obtuse*, when the end is rounded or blunt; *acute* when it comes to a sharp point; *acuminate*, when it terminates in a sharp point which inclines to one side; *emarginate* when there is a notch in the end of the leaf.

Remarks.—Many of the terms here applied to leaves are applied to other parts of a plant. Stems are pubescent, petals or calyxes may be lanceolate, ovate, serrate, or glabrous; fruit is may be orbicular, obtuse, emarginate.

B.—*Inflorescence.*—Inflorescence signifies the manner in which flowers are situated upon a plant. Flowers are situated in ten different ways.

1. *Whorled*, or verticillate, when the flowers encircle the stem, as horehound, motherwort.

2. *Raceme* having a main stem, with small stems branching from it, each supporting a flower as currants.

3. *Spike*, having a main stem with flowers resting upon it, as a head of rye or wheat.

4. *Head*, growing in a globose form, as clover.

5. *Fascicle*, a tuft of flowers on little stalks variously connected and subdivided, as Sweet-William.

6. *Umbel*, is composed of several stalks diverging from a centre and nearly equal in length, forming a level top, as caraway, fennel, dill.

7. *Cyme* is composed of several stalks diverging from a centre, and each branch variously divided, but forming nearly a level top, as elder.

8. *Corymb* is composed of several stalks *not* diverging from a common centre, but branching out on different parts of the stem and forming a level top, as yarrow.

9. *Panicle* is an irregularly subdivided cluster, as oats and many kinds of grass.

10. *Thyrse* is a very dense, close panicle, as lilac.

LESSON VII.

C.—*Stems.*—The stems of plants are various.

1. *Caulis* or *tidge*, is the stem that elevates the leaves and flower above the ground, as the trunk of a tree or a rose bush. It is *annual* in all kinds of grass, *perennial* in trees and shrubs ; it may be *simple*, as a holly-hock, or *branched* as in trees ; *leafy* having leaves on the caulis, or *naked ; upright* as trees ; *twining* as hops ; *climbing* as peas, gourds, and grapes ; *creeping* as black-berry vines ; it may be *round*, or *angular* being four or five sided ; *hairy* or *bristly*.

2. *Culm* is the stem of grass and grain, and is jointed. If the plant be bent at the joints it is said to be *geniculate*.

3. *Scape* is a leafless stem growing from the root supporting a flower, as in the dandelion.

4. *Peduncle*, is a leaf growing from the caulis, or branches supporting a flower. If it be a small stem proceeding from a main peduncle. it is called a pedicell, as the small stem to which a currant is attached.

5. *Petiole* is the stem which supports a leaf. A leaf without a petiole is said to be *sessile*. The petiole of some leaves is flat and thin, so that the leaf is in constant agitation, as poplar leaves.

6. *Frond* is a stem with its leaves as ferns or brakes.

7. *Stype*, is the stem which supports a toad-stool.

D.—*Roots.*—A root serves to fix and to convey nourishment to the plant.

Roots are distinguished into six kinds.

1. *Fibrous*, consisting only of thread-like branches, as the roots of grass.

2. *Creeping*, a root running along under the surface of the earth, about the same size in every part, as mint and gold thread.

3. *Fusiform*, or tap root, as a carrot or parsnip.

4. *Tuberous*, or knobbed root as Potatoe, having knobs growing along upon the branches of the root.

5. *Bulbous*, a globose root from which the stem immediately grows, as an onion ; in the onion it is laminar, in the white lilly scaly, and in some plants solid.

6. *Granular*, consisting of rounded grains attached to each other, resembling a string of beads, as the root of sorrel.

E.—*Appendages.*—Of these there are seven kinds.

1. *Stipule*, a leafy appendage attached to the petiole of a leaf, as willow leaves.

2. *Bract*, a leafy appendage attached to a flower, or its peduncle, often colored.

3. *Thorn*, a prickle growing out of the wood, as thorn bushes. The thorn often disappears if the plant is cultivated in a rich soil.

4. *Prickle*, growing from the bark as on rose-bushes, and never disappears by cultivation.

5. *Sting*, a coarse hair covering the stem and leaves of nettles and some other plants. It is tub-

ular and discharges a poisonous fluid which produces a violent itching in the flesh.

6. *Gland*, a very small tumour or knob at the base of a petal more commonly discharging honey.

7. *Tendril*, spiral or coiled, growing on climbing plants as peas, melons, grape vines, to aid them in climbing. Sometimes the petioles of a leaf wind round a limb to support the plant.

LESSON VIII.

Definitions of Terms not belonging to the preceding Divisions.

Axillary signifies that the flower, tendril, or bract grows in the angle between the leaf and stem, or branch and stem.

Aigrette, or egret, is the name of a hairy, feathery substance to which the seed of some plants is attached, as the down of dandelions and thistles.

Glabrous signifies a surface perfectly smooth, as an apple, the upper surface of an oak leaf, and the stem of pinks.

Subulate, awl-shaped and is applied to leaves, as of hemlock, to petals and appendages.

Androgynous, having stamens and pistils in different flowers on the same plant.

Annual is a term applied to plants, that grow up, bear seed, and die the same year; as potatoes, strawberries, and grasses, are *annual* plants, called also *herbaceous*.

Rye, onions, beets and carrots are called *biennial* plants, because they do not bear seed till the second year, and then die.

Apple trees, chesnut trees, &c. are called *perennial*, because they continue to bear fruit many years.

Names of classes used in Botanical books.

The 1st	class is called	*Monandria.*
The 2d	- -	*Diandria.*
The 3d	- -	*Triandria.*
The 4th	- -	*Tetrandria.*
The 5th	- -	*Pentandria.*
The 6th	- -	*Hexandria.*
The 7th	- -	*Heptandria.*
The 8th	- -	*Octandria.*
The 9th	- -	*Enneandria.*
The 10th	- -	*Decandria.*
The 11th	- -	*Dodecandria.*
The 12th	- -	*Icosandria.*
The 13th	- -	*Polyandria.*
The 14th	- -	*Didynamia.*
The 15th	- -	*Tetradynamia.*
The 16th	- -	*Monadelphia.*
The 17th	- -	*Diadelphia.*
The 18th	- -	*Syngenesia.*
The 19th	- -	*Gynandria.*
The 20th	- -	*Monoecia.*
The 21st	- -	*Dioecia.*
The 22d	- -	*Cryptogamia.*

Names of the orders of the first thirteen classes used in Botanical books.

The 1st order is	*Monogynia.*
The 2d	*Digynia.*
The 3d	*Trigynia.*
The 4th	*Tetragynia.*
The 5th	*Pentagynia.*
The 6th	*Hexagynia.*
The 7th	*Heptagynia.*
The 13th	*Polygynia.*

The 14th class has two orders. 1. Gymnosperma, seeds naked ; 2. Angiosperma, seeds covered.

The 15th class has two orders. 1. Siliculosa, pods as wide as they are long. 2. Siliquosa, pods long, as cabbage.

The 16th, 17th, 19th, 20th, and 21st classes, the names of classes are taken for orders.

The first order in each of these classes is Monandria, second Diandria, &c.

LESSON IX.

In this Lesson I shall proceed to bring together some miscellaneous remarks upon the physiology of plants.

The sap is water having earthy substances dissolved in it; it is absorbed by the roots, ascends in the wood, enters the leaves, where it gives off oxygen and absorbs carbon, descends in the bark, and deposits each year a layer of wood. If the leaves be stripped from a plant in the spring, the sap cannot pass from the wood to the bark, and consequently the plant will not grow any that year.

Plants change their specific *characters* and appearance by a change of soil and climate. The generic characters are for the most part unalterable. The Nasturtion, in New England is an *annual* plant and herbaceous, in the torrid zone, woody and perennial. Corn raised in a cold country will come to maturity if planted in a warm, earlier than that which is habituated to the soil; hence corn brought from Canada to Mass. is very early corn.

Trees are largest in the torrid zone and diminish in size as you depart from the equator. The largest trees on the earth are found in Africa, on the banks of the Senegal, called Baobab.

The fig trees of Malabar are fifty feet in circumference; the cedars of Lebanon, and the chesnuts of Mt. Ætna are thirty feet.

The manner by which seeds are dispersed over the surface of the earth is no less interesting than

wonderful. Some plants are very generally diffused, others are limited to a small territory, and others are common to all countries in the same zone. Field sorrel and white clover spring up wherever man fixes his habitation. The Baobab is limited to Africa—Cotton, Rice and sugar cane are the productions of warm climates. The native plants of South America are found on Western Africa, and in some of the western countries of Europe. Their seeds are such as float on water, and remain in it for a long time without injury. It is supposed the seeds swam across the Atlantic, and rooted themselves in a foreign soil. Those seeds which have egret attached to them, as thistles and dandelions rise and float in the atmosphere. There is one plant in Europe the seeds of which were borne by the wind from the American Continent. Birds and other animals disperse seeds.

The age of perennial plants is very various.—— Oaks live it is supposed from 600 to 900 years. The age of plants therefore varies from one day, as mushrooms, to 900 years.

Decay in many plants commences at the centre, or heart, hence trees live often a long time after they become hollow. Pines and evergreens of this class generally exhibit the first symptoms of decay externally, the heart is most incorruptible. The longest lived trees grow in a soil moderately dry.

The buds of plants contain the leaves and usually the flowers. A German botanist analysed a bud about the size of a pea from a walnut in the spring, and found the envelope to consist of about 20 scales, this was lined with a coat of soft down, in which was rolled up the embryo of 25 leaves and 60 flowers. This envelope of scales and down is to protect the embryo leaves from the cold of winter.

CLASS II.—*Diandria.*—ORDER I.—*Monogynia.*

SYRINGA.—Corol 1-petalled, salver form, capsule 2-celled ; inflorescence a thyrse.

Officinalis, a shrub ten feet high, leaves sub-cordate, glabrous, acute ; flowers in May. *Lilac.*

VERONICA, calyx 4-parted, corol wheel form, capsule obcordate ; inflorescence a raceme.

Serpyllifolia, leaves ovate crenate, smooth, three to six inches high ; grows about houses and by the road side, flowers in May. *Speedwell.*

HEDEOMA, calyx 2-lipped, upper lip three toothed, teeth lanceolate, corol 1-petalled, labiate, 2 stamens barren.

Pugilcoides, leaves oblong remotely serrate, flowers axillary, peduncles short, strong scented ; flowers in July and August. *Pennyroyal.*

SALVIA, calyx tubular, striate, corol one petalled labiate.

Officinalis, leaves lance ovate, rugose, crenulate, mucronate, flowers in July. *Sage.*

CLASS III.—*Triandria.*—ORDER I.—*Monogynia.*

IRIS, Calyx a spathe 2 or 3 leaved, corol 6-parted, alternate divisions reflected. Stigmas 3, covering the stamens.

Virginica. Stem two edged, many flowered, higher than the ensiform leaves, stigmas shorter than the inner petals, capsules oblong with furrowed angles. *Wild-Iris.*

Pumila, stem 6 inches high, scape one flowered, leaves lanceolate, glabrous ; petals, oblong, obtuse. *Dwarf flower de-luce.*

ORDER II.—*Digynia.*

SECALE, Calyx a glume 2-valved, two or many flowered, opposite, glumes linear, lanceolate.

Cereale, glume scabrous ciliate, scales of the calyx narrow, awns long and reverse prickly, inflorescence a spike. *Rye.*

Avena,—Calyx a glume two-valved, many flowered, corol valves with a twisted awn on the back.

Sativa, inflorescence a panicle, calyx two-seeded, seeds smooth, cultivated, discovered first in the island of Juan Fernandez. *Oats.*

Sorghum, Florets in pairs, one perfect, with a three-valved corol, sessile ; inflorescence a panicle.

Saccharatum, branches of the panicle somewhat whorled, spreading ; seeds oval, glumes covered with soft hair. Introduced from the East Indies. *Broom-corn.*

Vulgare, panicle compact, oval, seed naked subcompressed, glumes black. *Coffee-corn.*

Class IV.—*Tetrandria.*—Order I.—*Monogynia.*

Dipsacus, Involucre, or common calyx many leaved, proper calyx one leaved, superior ; seed one, crowned, corol one-petaled.

Fullonum, receptacle chaffy, inflorescence an ovate head ; leaves sessile, serrate ; calyx hooked. *Teasel.*

Houstonia, Calyx four-cleft, corol salver-form, tube short, capsule two-celled.

Coerulea, stem erect, setaceous, cauline leaves oblanceolate, peduncles one-flowered, elongated. ——— *Venus' pride.*

Class V.—*Pentandria.*—Order I.—*Monogynia.*

Symphitum, corol one-petaled, tubular, upper part inflated, throat closed with subulate rays.

Officinale, leaves ovate sub-lanceolate, decurrent, rough, hairy, flowers white. *Comfrey.*

Verbascum, corol wheel form, five lobed, somewhat irregular, stamens declined, hairy ; capsule two-celled.

Thapsus, leaves decurrent, both sides wooly ; inflorescence a cylindrical spike, corol yellow. *Mullein.*

Ipomoea, corol funnel form, with five folds; stigma a globose head, capsule three-celled.

Purpurea, leaves cordate, entire, peduncles two to five flowered, divisions of the calyx lanceolate, capsules glabrous, corol purple. *Morning glory.*

Solanum, calyx permanent, corol wheel form, five-lobed, anthers thick, partly united; pericarp a berry.

Tuberosum, stem angular, leaves interruptedly pinnate; root tuberous; first found in S. America. *Potatoe.*

Capsicum, corol wheel form, berry inflated, anthers converging; calyx angular.

Annuum, stem herbaceous, peduncles solitary. *Red-pepper.*

Viola, calyx five-leaved, corol irregular, with a horn behind, five-petalled inferior, anthers attached by a membraneous tip.

Tricolor, stem angular, branched; leaves oblong, deeply crenate, stipules deeply pinnatifid, grows in gardens. *Garden-violet.*

Cucullata, glabrous, leaves cordate, serrate, rolled in at the base; scapes one-flowered, of the length of the petioles, petals bent obliquely, side ones bearded. *Blue-violet.*

Blanda, glabrous, leaves cordate, flattish, remotely serrate, scape of the length of the leaves; petals beardless, lower longer than the rest, marked with blue stripes. *White violet.*

Ribes, corol five-petalled, superior, stamens stand on the calyx, berry many seeded.

Rubrum, racemes nodding; corol flat, petals obcordate, leaves obtusely five lobed. *Currant.*

Floridum, racemes pendant; leaves punctate both sides, calyx cylindric, bracts longer than the pedicels. *Black-currant.*

Triflorum, spines sub-axillary, leaves three to five lobed, gash toothed, peduncles three flowered, pedicels elongated, berry glabrous, pale red. *Goose-berry.*

ORDER II.—*Digynia.*

CARUM, corol five-petalled, petals carinate, emarginate, inflorescence an umbel, involucre 1-leafed, seed striate.

Carui, stem branched, leaves with ventricose sheaths. *Carraway.*

ORDER V.—*Pentagynia.*

LINUM, calyx five-leaved, corol five-petalled inferior, capsule five to ten celled.

Usitatissimum, leaves of the calyx ovate, acute three-nerved, petals crenate, leaves lanceolate, alternate, stem simple. *Flax.*

CLASS VI.—*Hexandria.*—ORDER I.—*Monogynia.*

TRADESCANTIA, caylx inferior, three-leaved, corol three petalled, filaments with jointed beards, capsule three celled.

Virginica, erect, leaves lanceolate, elongated, flowers sessile, inflorescence umbel-like, pubescent, grows in gardens, flowers blue. *Spider-wort.*

HEMEROCALLIS, Corol six-parted, funnel form, calyx none, stamens declined, stigma small.

Flava, leaves broad, linear, keeled, petals flat, acute, nerves of the petal undivided, grows in gardens and door-yards. *Day-lilly.*

LILIUM, corol inferior, liliacious, six petals with a line from the middle to the base; stigma undivided.

Canadense, leaves remotely whorled, lanceolate three-nerved, nerves beneath hairy, peduncles terminal, in threes nodding. *Yellow-lilly.*

Philadelphicum, leaves whorled, lance-linear, stem about two flowered, corol erect, petals spreading. *Red-lilly.*

TULIPA, corol liliacious, stigma thick, capsule oblong, three sided.

Gesneriana, stem one flowered, glabrous, flower various colored, erect, petals obtuse leaves lanceolate. *Tulip.*

CLASS VIII.—*Octandria.*—ORDER I.—*Monogynia.*

TROPOLEUM, calyx four or five cleft, colored, spurred, petals four or five ; nuts leathery, sulcate.

Majus, leaves peltate, petals obtuse, some of them fringed, stem creeping, grows in gardens. *Nasturtion.*

ORDER II.—*Digynia.*

POLYGONUM, calyx inferior, five parted, colored, corol none, seed one, angular, covered with the calyx ; stamens and pistils vary in number.

Orientale, flowers in crowded spikes oblong, leaves ovate, stem erect, five or six feet high, stipules rough haired.

Ragged sailor or prince's feather.

Fagopyrum, Inflorescence a panicled raceme, leaves cordate, arrow form, stem erect.

Buck-wheat.

CLASS IX.—*Enneandria.*—ORDER I.—*Monogynia.*

LAURUS, Calyx none, corol resembling a calyx four to six parted. Nectary with three two-awned glands surrounding the germ. Drupe one-seeded.

Sassafras. A small tree sometimes 25 feet high, frequently only a shrub. Leaves entire, or 2 and three lobbed on the same plant, glabrous, or pubescent. Flowers in umbels, yellow. The bark of the root very fragrant, very common along fences, and around old fields. Flowers in March, before the leaves put forth. *Sassafras.*

Benzoin, leaves obovate, lanceolate, pubescent underneath, flowers in clustered umbels ; bark has a spicy taste, grows four to eight feet high, on the margin of rivulets, flowers in March.

Spice-bush.

Class X.—*Decandria.*—Order I.—*Monogynia.*

Ruta, Calyx five parted ; petals concave ; receptacle surrounded by ten nectariferous dots ; capsule lobed.

Graveolens, leaves compound, leafets oblong, terminal one obovate, petals entire ; grows in gardens. *Rue.*

Kalmia, calyx five-parted ; corol wheel-salver-form, with 10 cavities containing the anthers, forming ten horns underneath ; capsule five-celled.

Latifolia, a shrub from three to eight feet high, leaves perennial glossy, entire, oval, long petioled, corymbs terminal with viscid hairs, flowers in April, leaves generally supposed to be poisonous.

Laurel.

Angustifolia, a shrub one or two feet high ;—leaves oblong, obtuse, sometimes rusty beneath ; flowers in small lateral corymbs, of deep rose color.

Sheep-laurel.

Vaccinium, calyx 5-toothed, corol pitcher form five-cleft the divisions reflected, filament inserted on the germ with the corol.

Resinosum, leaves slender, petioled, oblong-oval, obtuse, entire, bedewed with resinous dots ; racemes lateral ; pedicels short ; berries black.

Black-whortleberry.

Frondosum, leaves oblong-ovate, obtusish, entire glabrous ; pedicels long, filiform, bracted ; corol ovate bell-form, about three feet high, berries large and blue. *Blue whortleberry.*

Dumosum, branches, leaves and racemes a little hispid ; leaves oblong-obovate.acute at the base, mucronate ; racemes bracted, pedicels short axillary, sub-solitary. *Bush-whortleberry.*

Order II.—*Digynia.*

Saponaria, Calyx inferior, one-leafed, tubular : corol caryophyllous, capsule oblong, one celled.

Officinalis, leaves lance-ovate. 12 or 14 inches high; grows in gardens and by the road side.
Soap-wort.

Dianthus, Calyx inferior, cylindric, one leafed with scales at the base, corol caryophyllous; capsules cylindric, opening at the top.

Barbatus, flowers fascicled, scales of the calyx ovate subulate, equalling the tube; leaves lanceolate. *Sweet-William.*

Plumarius, flowers solitary, scales of the calyx sub-ovate, very short and obtuse, petals many-cleft, throat of the corol hairy. *Single pink.*

Caryophyllus, flowers solitary; scales of the calyx sub-rhomboid; petals crenate, beardless.
Carnation pink.

Order V.—*Pentagynia.*

Oxalis, calyx five-leaved inferior; petals five, cohering by the claws; capsule five celled, five cornered, opening at the corners; five stamens shorter than the others.

Stricta, stem erect branching, peduncles umbelliferous; leaves ternate, obcordate; petals obovate.
Yellow wood sorrel.

Class XII.—*Icosandria.*—Order V.—*Pentagynia.*

Pyrus, calyx five-cleft, superior; corol rosaceous, pericarp a pomum, five-celled many seeded.

Communis, leaves ovate serrate peduncles corymbed; there are several varieties. *Pear.*

Malus, flowers in sessile umbels, leaves ovate-oblong, acuminate, serrate, glabrous; many varieties.
Apple.

Cydonia, flowers solitary, fruit tomentose when young, leaves ovate entire. *Quince.*

Order XIII.—*Polygynia.*

Rosa, calyx urnform, contracted at the throat 5-cleft, petals 5, seeds numerous, hispid fixed to the sides of the calyx within.

Semperflorens, germs ovate oblong, tapering to both ends, germs and peduncles hispid, stem prickly.

Monthly rose.

Alba, germs ovate, glabrous, or hispid, leafets ovate, villose beneath. *White-rose.*

Damascena, calyx half pinnate, germ ovate, turgid, bristly, stem and petioles prickly, leaves downy beneath. *Damask rose.*

Burgundica, germ sub-globse, leafets ovate, pubescent beneath, corol small, red.

Burgundy rose.

Cinnamonea, germs globose, germs and peduncles glabrous, leafets oblong. Stems cinnamon color.

Cinnamon rose.

Rubus, calyx five-cleft, inferior ; corol five-petalled ; berry composed of pulpy grains each one seeded.

Trivialis, stem procumbent, petioles and peduncles hispid, with prickles recurved ; leaves ternate or quinate, oblong, oval, acute, unequally serrate, pedicels solitary, elongated, petals obovate.

Creeping Blackberry.

Villosus, pubescent, hispid and prickly ; leaves ternate or quinate, ovate-oblong, hairy both sides : calyx short, acuminate, racemes lax.

High blackberry.

Strigosus, rigidly hispid, leafets ternate, oval, at the base obtuse, white downy beneath, flowers axillary, solitary peduncles and calyx hispid.

Red raspberry.

Occidentalis, branches and petioles glaucous and prickly ; leaves ternate, sub-lobate and doubly serrate, downy beneath ; petioles terete.

Black raspberry.

Fragaria, Calyx inferior ten-cleft ; corol rosaceous ; receptacle ovate, berry-like, caducous.

Vesca, calyx of the fruit reflexed, hairs on the petioles spreading, on the peduncles close pressed.

Garden strawberry.

Virginiana, hairs on the petioles erect, leaves ternate, serrate, glabrous above.

Wild strawberry.

Class XIV.–*Didynamia.*–Order I.–*Gymnosperma.*

Nepeta, Calyx dry, striated ; corol with a longish tube, under lip of the middle division crenate, stamens approximate.

Cataria, flowers in whorled spikes, leaves petioled cordate, tooth-serrate. *Cat-mint.*

Hyssopus, corol with the under lip three-parted, stamens strait, distant.

Officinalis, flowers whorled, racemes one way, leaves lance-linear. *Garden hyssop.*

Nepetoides, spikes whorled cylindric, leaves subcordate, ovate, acuminate. *Giant hyssop.*

Mentha, corol nearly equal four-cleft, broadest division emarginate, stamens erect, distant.

Viridis, spikes oblong, interrupted ; leaves lanceolate, serrate, sessile ; stamens longer than the corol. *Spear mint.*

Piperita, spikes obtuse, leaves sub ovate, petioled, stem glabrous at the base.

Pepper mint.

Satureia, calyx tubular, striate ; corol with divisions nearly equal ; stamens distant.

Hortensis, peduncles axillary, somewhat in a cyme, leaves lanceolate entire.

Summer savory.

Montana, peduncles sub-one-sided, segments of the calyx acuminate, mucronate.

Winter savory.

CLASS XV.—*Tetradynamia.*—ORDER I.—*Siliculosa.*

LEPIDIUM, calyx spreading ; corol regular ; silicle emarginate, cordate or oval ; cells one-seeded ; valves carinate.

Sativum, leaves oblong, many cleft.

Pepper grass.

Virginicum, radicle leaves pinnatifid, cauline ones lance-linear, sub-gash-serrate ; grows about houses. *Wild pepper grass.*

THLAPSI, calyx spreading, silicle emarginate, obcordate many seeded ; valves resemble two boats, keels outward.

Bursa-pastoris, hirsute, silicles obcordate ; radical leaves pinnatifid. Common in April.

Shepherd's purse.

ORDER II.—*Siliquosa.*

BRASSICA, calyx erect, converging ; partition extending beyond the valves of the silique ; seed globose.

Oleracea, root caulescent, terete, fleshy ; leaves smooth glaucous, repand and lobate. *Cabbage.*

Rapa, root orbicular, depressed, fleshy, radical leaves rough, cauline ones smooth. *Turnip.*

RAPHANUS, calyx closed, setose ; silique terete, not opening by valves.

Sativus, leaves lyrate ; silique terete, two-celled One variety has a fusiform root, and another sub globose root. *Radish.*

SINAPIS, calyx spreading, corol with strait claws ; partition extending beyond the valves of the silique.

Nigra, silique glabrous, three sided, somewhat smooth, close pressed to the stem.

Common mustard.

Alba, silique bristly shorter than the two-edged beak ; leaves pinnatifid, irregularly toothed.

Yellow seed mustard.

CLASS XVI.—*Monadelphia.*—ORDER XIII.—*Polyandria.*

MALVA, calyx double, outer one three-leaved, inner one five-cleft ; capsules many, one seeded.

Rotundifolia, leaves heart-orbicular, obsoletely five-lobed, stem prostrate ; very common.

Low mallows.

Sylvestris, stem three feet high erect ; leaves seven lobed acutish, peduncles and petioles hairy : flowers red. *Mallows.*

Crispa, stem erect tall, leaves angular, crispid ; flowers axillary, glomerate. *Curled mallows.*

ALTHAEA, calyx double, outer one 6 to nine-cleft ; capsules many, one seeded.

Rosea, stem erect ; leaves rough, cordate, five to seven angled, crenate. *Holly hock.*

CLASS XVII.—*Diadelphia.*—ORDER X.—*Decandria.*

PISUM, calyx with divisions leaf like ; banner protruding two folds ; style compressed, carinate villose above.

Sativum, petioles terete ; stipules round and crenate at the base ; peduncles many flowered. *Pea.*

PHASEOLUS, keel stamens and style spirally twisted together, legume compressed, kidney form.

Vulgaris, stem twining, racemes solitary, shorter than the leaves, peduncled inpairs ; legumes pendulous. From the East Indies.

Common pole bean.

Nanus, stem erect smooth ; bracts larger than the calyx ; legumes compressed, rugose.

——— *Bush bean.*

CLASS XX.—*Monoecia.*—ORDER III.—*Triandria.*

ZEA, Staminate flowers, calyx glume two-flowered, awnless, corol glume awnless. Pistillate flowers, calyx glume two valved style 1, long filiform, seed immersed in an oblong receptacle.

Mays, leaves lance-linear ; entire, keeled.

Indian corn.

Index to Popular Names.

NOTE.—Words employed in describing plants not defined in this book may be found generally in Dictionaries of the English Language.

Every plant in Botanical books has two names, the first is the name of the genus, the second of the species. Here the name of the genus is printed in small capitals, the species in italics.

Plants must be examined when in full blossom, for then the stamens and pistils can be counted.—They may be dried and kept for any length of time; a book of dried plants is called *Herbarium*. They are prepared for an herbarium by spreading them flat between coarse papers, covering them with a board upon which is placed a stone weighing 50lbs. They should be taken out and exposed to the air daily until they are thoroughly dry.

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